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Abstract

PRESENT CONCEPTIONS OF THE C.E.A. CONCERNING THE DEVELOPMENT OF FAST NEUTRON REACTORS

by G. VENDRYES

(Commissariat à l'Energie Atomique, France)

1° - The position of fast neutron reactors in the French nuclear energy program.

In developing a program based on natural uranium, France will have an important stock of plutonium rich in higher isotopes. The existence of this plutonium and of the depleted uranium arising from the same reactors, has, as a logical consequence, the use of both in fast neutron reactors. Justified by this short term interest, the achievement of fast neutron reactors does, moreover, provide for a future necessity.

2° - Description of a fast neutron central power station of 1000 MWe.

We indicate the characteristics of a future fast neutron central power station, plutonium fuelled, and sodium cooled. However uncertain these characteristics may be, they constitue a necessary guide in the orientation of our work.

3° - Studies carried out up to the present time.

We give an outline of those studies, often very preliminary, which have given the characteristics cited above. The principal technical areas taken up are the following :

- Neutronics (critical masses, breeding ratios, enrichments, flattening of the

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neutron flux, coefficients of reactivity, reactivity changes as a function of irradiation).

- Dynamics, control, and safety.
- Fuel
- Technology (design of the core and vessel, of the sodium system, and of the fuel handling mechanisms).

These technical studies are complemented by economic considerations. The choice of the optimum characteristics is related to the existence of power production programs, and, in these programs, to the existence of plutonium producing thermal reactors. It is shown how, in this context, the existence of plutonium should be taken into account, and, in addition which mechanisms relate the economics of this plutonium to the choice of the most important parameters of the breeder reactors.

4° - Prototype reactor.

The interest in an intermediate stage consisting of a reactor of a power level of about 80 MWe is justified. Its essential characteristics are briefly presented.